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Rec'd PCT/PTO 17 MAR 2005

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CLAIMS

[Utility model registration claim]

[Claim 1] The lighting system for test equipment equipped with the following element.

- a. The flat base which has in the center opening which opens the visual field of a checking camera.
- b. Two or more 1st emitters set up so that it might point to the subject of examination to which it is arranged at the periphery section of said base, and each optical axis exists on extension of said opening.
- c. Two or more 2nd illuminants set up so that it might be arranged inside said 1st illuminant and each optical axis might point to a base core.
- d. The mirror side which it is prepared [side] in the outside of said opening and changes the light from said 2nd emitter in the direction of a subject of examination.
- e. The half mirror which it is prepared [half mirror] between opening and said checking camera, and carries out incidence of the image to be examined to a checking camera.
- f. The 3rd emitter which irradiates light and gives the overhead light of a checking camera and the same axle to said half mirror to a subject of examination.

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DETAILED DESCRIPTION

[Detailed explanation of a design]

[0001]

[Industrial Application]

This design is related with the lighting system combined with the checking camera which catches an image to be examined.

[0002]

[Description of the Prior Art]

The technique of inspecting by catching an image to be examined with a camera is extensively used by current. There are many the examples of use especially at an electronic-circuitry substrate production process. In such inspection technique, a lighting system influences the image recognition engine performance. From a recognition rate changing with directions of light, with the lighting system put in practical use, an emitter is arranged in various locations and switch use (or coincidence use) is carried out according to a subject of examination in many cases. The example can be seen to JP,64-20402,A, JP,2-268260,A, JP,4-166709,A, etc.

[0003]

[Problem(s) to be Solved by the Device]

From the relation of a focal distance, a large distance of a checking camera and a subject of examination may be unable to be taken. In spite of such spatial constraint, it is going to offer the equipment which can illuminate a subject of examination in the various modes.

[0004]

[Means for Solving the Problem]

About this design, the flat base which has opening in the center is equipped with two kinds of emitters. The 1 is two or more 1st emitters arranged at the periphery section of the base, and the optical axis points to a subject of examination. The 2 is two or more 2nd illuminants arranged inside the 1st illuminant, and the optical axis points to a base core. The light from this 2nd emitter is changed in the direction of a subject of examination by the mirror side of the outside of opening. A half mirror is placed between opening and a checking camera, and the light of the 3rd emitter is irradiated at this half mirror.

[0005]

[Function]

The light from the 1st and 2nd emitter hits a subject of examination from a respectively different include angle. It is reflected by the half mirror and the light from the 3rd emitter hits [of a checking camera] a subject of examination from an optical axis. The light reflected by the subject of examination goes into a checking camera through a half mirror.

[0006]

[Example]

One example is explained based on drawing. 1 is the subject of examination supported horizontally, and assumes the electronic-circuitry substrate here. 2 is a checking camera arranged on a subject of examination.

A lighting system 10 is fixed to the lens cylinder 3 of the checking camera 2.

[0007]

A lighting system 10 is equipped with the block 11 which receives the lens cylinder 3 and is fixed, and the base 12 connected with the block 11. The base 12 is carrying out the flat disk configuration, and has in the center the circular opening 13 which opens the visual field of the checking camera 2.

[0008]

In the periphery section of **SU 12, two or more 1st emitter 14 which consists of light emitting diode is arranged annularly. The optical axis of the 1st emitter 14 points to the part included in the inspection visual field of a subject of examination 1. Inside the 1st emitter 14, two or more 2nd emitters 15 which consist of light emitting diode are arranged annularly. The optical axis of the 2nd illuminant 15 points to the core of the base 12 instead of a subject of examination 1. The mirror side 16 which is annular and inclined is established in the outside of opening 13, and this mirror side 16 changes the light from the 2nd emitter 15 in the direction of a subject of examination 1.

[0009]

Between opening 13 and the checking camera 2, a half mirror 17 is arranged at the include angle of 45 degrees. The image of a subject of examination 1 will be incorporated by the checking camera 2 through a half mirror 17. The mirror arranged at the include angle of 45 degrees as face to face [18] as a half mirror 17 and 19 are the 3rd emitter arranged on a mirror 18. The 3rd emitter 19 consists of high brightness type light emitting diode.

[0010]

The 1st, 2nd, and 3rd emitter 14, 15, and 19 mixes together and uses the light emitting diode of various kinds of colors if needed. 20 is the control unit of a lighting system 10.

[0011]

Actuation of the above-mentioned equipment is as follows. If the light is switched on to the 1st emitter 14, the light from there will illuminate a subject of examination 1 from across. If the light is switched on to the 2nd emitter 15, it will be reflected in respect of [16] a mirror, and the light from there will illuminate a subject of examination 1 from the include angle more near a perpendicular. If the light is switched on to the 3rd emitter 19, it will be reflected by the mirror 18 and the half mirror 17, and the light from there will serve as epi-illumination which illuminates a subject of examination 1 right above, i.e., from [of the checking camera 2] an optical axis. A control unit 20 is independent, combines three kinds of emitters [two kinds of] at a time, or three-kind coincidence is made to turn it on. That is, seven kinds of lighting modes are possible in all. The program defined beforehand performs selection in lighting mode. It is possible to feed back an image recognition result and to also make the optimal mode choose immediately.

[0012]

[Effect of the Device]

Although vertical illumination is obtained for the slanting lighting from the include angle which changes with the 1st emitter and 2nd emitters with the 3rd emitter and a half mirror about this design, respectively, it is the sake of a half mirror. Since it considers as the arrangement the slanting arrangement which takes thickness was stopped about the 2nd illuminant put on the location which is spatially hard-pressed, and it turned [arrangement] to the base core, the light is reflected in respect of a mirror and it was made to hit against a subject of examination, it was able to consider as the compact configuration which saved thickness as a whole.

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TECHNICAL FIELD

[Industrial Application]

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PRIOR ART

[Description of the Prior Art]

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EFFECT OF THE INVENTION

[Effect of the Device]

Although vertical illumination is obtained for the slanting lighting from the include angle which changes with the 1st emitter and 2nd emitters with the 3rd emitter and a half mirror about this design, respectively, it is the sake of a half mirror. Since it considers as the arrangement the slanting arrangement which takes thickness was stopped about the 2nd illuminant put on the location which is spatially hard-pressed, and it turned [arrangement] to the base core, the light is reflected in respect of a mirror and it was made to hit against a subject of examination, it was able to consider as the compact configuration which saved thickness as a whole.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Device]

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MEANS

[Means for Solving the Problem]

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OPERATION

[Function]

The light from the 1st and 2nd emitter hits a subject of examination from a respectively different include angle. It is reflected by the half mirror and the light from the 3rd emitter hits [of a checking camera] a subject of examination from an optical axis. The light reflected by the subject of examination goes into a checking camera through a half mirror.

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EXAMPLE

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of a lighting system.

[Drawing 2] It is the bottom view of the lighting system fractured partially showing arrangement of an emitter.

[Description of Notations]

1 Subject of Examination

2 Checking Camera

10 Lighting System

12 Base

13 Opening

14 1st Emitter

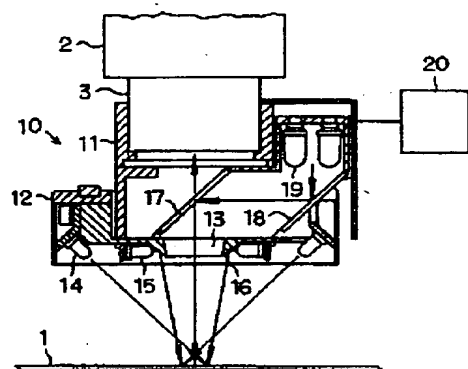
15 2nd Emitter

16 Mirror Side

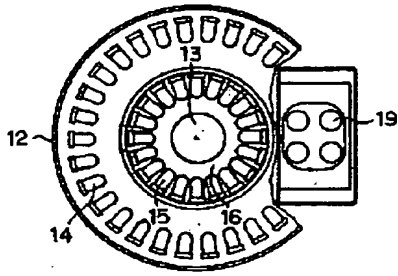
17 Half Mirror

19 3rd Emitter

[Translation done.]

Drawing selection 

[Translation done.]

Drawing selection 

[Translation done.]

(19)日本国特許庁 (J P)

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G 0 1 B 11/24	Z	9108-2 F		

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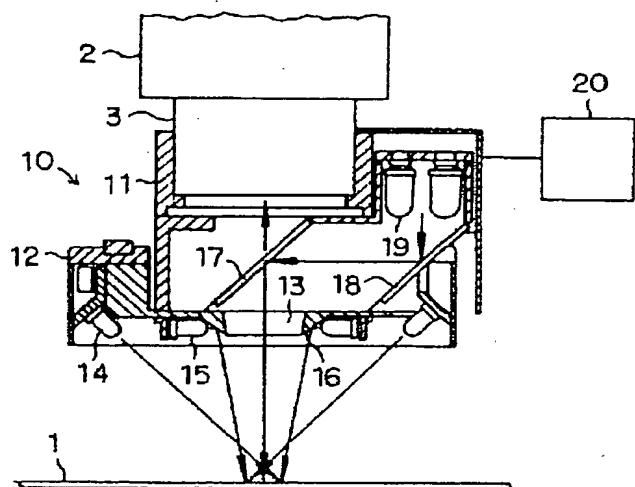
(74)代理人 弁理士 西野 卓嗣

(54)【考案の名称】 検査装置用照明装置

(57)【要約】

【目的】 異なる方向からの斜め照明と、同軸落射照明が可能で、コンパクトな照明装置を提供する。

【構成】 フラットなベース 12 の外周部に複数の第 1 発光体 14 を配置する。第 1 発光体 14 の光軸は検査対象 1 を指向する。第 1 発光体 14 の内側には複数の第 2 発光体 15 を配置する。第 2 発光体 15 はベース 12 の中心を指向し、その光はミラー面 16 で検査対象 1 の方向に方向転換せられる。ベース 12 の中央には検査用カメラ 2 の視野を開く開口 13 があり、開口 13 と検査用カメラ 2 の間にはハーフミラー 17 が置かれ、このハーフミラー 17 が、第 3 発光体 19 からの光を検査用カメラ 2 と同軸の落射照明に転換する。



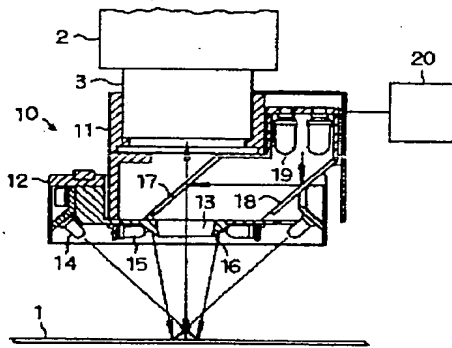
1

【実用新案登録請求の範囲】

【請求項 1】 下記要素を備えた検査装置用照明装置。

- a. 検査用カメラの視野を開く開口を中央に有するフラットなベース。
- b. 前記ベースの外周部に配置され、各々の光軸が、前記開口の延長上に存在する検査対象を指向するよう設定された複数個の第 1 発光体。
- c. 前記第 1 発光体の内側に配置され、各々の光軸がベース中心を指向するよう設定された複数個の第 2 発光体。
- d. 前記開口の外側に設けられ、前記第 2 発光体からの光を検査対象方向に方向転換させるミラー面。
- e. 開口と前記検査用カメラの間に設けられ、検査対象の像を検査用カメラに入射させるハーフミラー。
- f. 前記ハーフミラーに光を照射し、検査対象に対し検査用カメラと同軸の落射光を与える第 3 発光体。

【図 1】



2

【図面の簡単な説明】

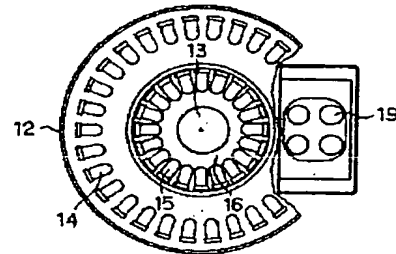
【図 1】 照明装置の断面図である。

【図 2】 発光体の配置を示す、部分的に破断した照明装置の下面図である。

【符号の説明】

- 1 検査対象
- 2 検査用カメラ
- 10 照明装置
- 12 ベース
- 13 開口
- 14 第 1 発光体
- 15 第 2 発光体
- 16 ミラー面
- 17 ハーフミラー
- 19 第 3 発光体

【図 2】



【考案の詳細な説明】**【0001】****【産業上の利用分野】**

本考案は検査対象の像をとらえる検査用カメラに組み合わせる照明装置に関する。

【0002】**【従来技術】**

検査対象の像をカメラでとらえて検査を行う手法は、現在では広汎に利用されている。電子回路基板製造工程では、特にその使用例が多い。このような検査手法において、画像認識性能を左右するのが照明装置である。光の方向により認識率が異なることから、実用化されている照明装置では、様々な位置に発光体を配置し、検査対象に応じ切り換え使用（あるいは同時使用）することが多い。特開昭64-20402号公報、特開平2-268260号公報、特開平4-166709号公報等にその例を見ることができる。

【0003】**【考案が解決しようとする課題】**

焦点距離の関係から、検査用カメラと検査対象との距離を大きくとれない場合がある。そのような空間的制約にもかかわらず、多様なモードで検査対象を照明できる装置を提供しようとするものである。

【0004】**【課題を解決するための手段】**

本考案では、中央に開口を有するフラットなベースに2種類の発光体を装着する。その一は、ベースの外周部に配置された複数個の第1発光体で、その光軸は検査対象を指向する。その二は第1発光体の内側に配置された複数個の第2発光体で、その光軸はベース中心を指向する。この第2発光体からの光は、開口の外側のミラー面により検査対象方向に方向転換させられる。開口と検査用カメラの間にはハーフミラーを置き、このハーフミラーに第3発光体の光を照射する。

【0005】**【作用】**

第1、第2発光体からの光は各々異なる角度から検査対象に当る。第3発光体からの光は、ハーフミラーで反射されて検査用カメラの光軸方向から検査対象に当る。検査対象によって反射された光は、ハーフミラーを通して検査用カメラに入る。

【0006】

【実施例】

図に基づき一実施例を説明する。1は水平に支持した検査対象で、ここでは電子回路基板を想定している。2は検査対象の上に配置した検査用カメラである。検査用カメラ2のレンズ筒3に照明装置10を固定する。

【0007】

照明装置10は、レンズ筒3を受け入れ固定するブロック11と、ブロック11に連結したベース12とを備える。ベース12はフラットな円盤形状をしており、中央には検査用カメラ2の視野を開く円形の開口13を有する。

【0008】

ベース12の外周部には発光ダイオードからなる第1発光体14を複数個、環状に配置する。第1発光体14の各々の光軸は、検査対象1の、検査視野に含まれる個所を指向する。第1発光体14の内側には、発光ダイオードからなる複数個の第2発光体15を環状に配置する。第2発光体15の光軸は検査対象1ではなくベース12の中心を指向する。開口13の外側には環状であり且つ傾斜したミラー面16が設けられ、このミラー面16が第2発光体15からの光を検査対象1の方向に方向転換させる。

【0009】

開口13と検査用カメラ2との間にはハーフミラー17を45°の角度で配置する。検査対象1の像はハーフミラー17を介して検査用カメラ2に取り込まれることになる。18はハーフミラー17と向かい合わせに45°の角度で配置されたミラー、19はミラー18の上に配置された第3発光体である。第3発光体19は高輝度タイプの発光ダイオードからなる。

【0010】

第1、第2、第3発光体14、15、19とも、必要に応じ各種の色の発光ダ

イオードを取り混ぜて使用する。20は照明装置10の制御装置である。

【0011】

上記装置の動作は次のようになる。第1発光体14に点灯すると、そこからの光は検査対象1を斜めから照らす。第2発光体15に点灯すると、そこからの光はミラー面16で反射され、検査対象1をより垂直に近い角度から照らす。第3発光体19に点灯すると、そこからの光はミラー18とハーフミラー17で反射され、検査対象1を真上から、つまり検査用カメラ2の光軸方向から照らす落射照明となる。制御装置20は3種類の発光体を単独で、あるいは2種類ずつ組み合わせ、あるいは3種類同時に、点灯させる。すなわち全部で7通りの照明モードが可能である。照明モードの選択は、予め定めたプログラムにより行う。画像認識結果をフィードバックして直ちに最適モードを選択させることも可能である。

【0012】

【考案の効果】

本考案では、第1発光体と第2発光体により異なる角度からの斜め照明を、第3発光体とハーフミラーにより同軸落射照明を、それぞれ得るものであるが、ハーフミラーのため空間的にゆとりのない場所に置く第2発光体に関しては、厚みをとる斜め配置をやめてベース中心を向いた配置とし、その光をミラー面で反射して検査対象に当てるようにしたので、全体として厚みを節約した、コンパクトな構成とすることができた。